Oviparity in a Sea-Snake, Laticauda colubrina (Schneid)

By N. Smedley, *M. A.*

(with one text figure)

Under the above heading I recently (1) recorded an apparent case of oviparity in one of six Sea-Snakes kept in captivity in the Raffles Museum. As all Sea-Snakes of the family *Hydrophiidae* have been definitely stated to be viviparous (2) observations have been made on this species and are here set down.

Six snakes were kept in a tank containing sea-water. Eggs were laid as follows; it should be noted that they were usually observed in the morning on opening the Museum and had been laid overnight. The date given is that on which they were observed.

5-6-30.—Six eggs. Two taken out for examination, the remainder left in the water. The two eggs measured 80 mm. x 25 mm. and 68 mm. x 27 mm. The shell was less hard and leathery than that of most land-snakes, but was tough and thick although the yolk and germinal disc were visible through it. On 11th June, two more eggs were taken out; they measured 74 mm. x 25 mm. and 72 mm. x 25 mm. A photograph of the latter (fig. 1) was taken and the eggs replaced.

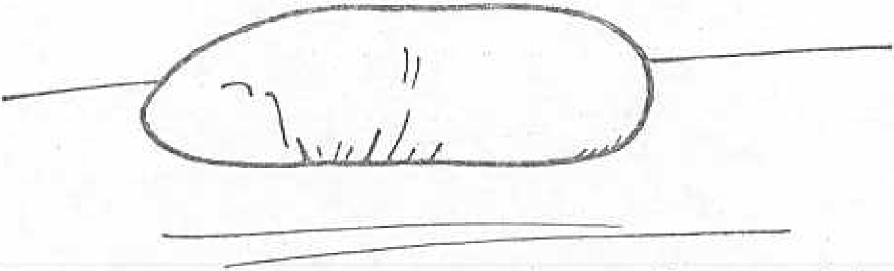

Fig. 1. Egg of *Laticauda colubrina.* About natural size. (From a Photograph).

16-6-30.—Another egg, 71 mm. x 22 mm. was seen. As no outline of the yolk was visible the egg was opened and found to contain a thin milky fluid with broken cream coloured yolk particles. This egg was infertile. The snake which was believed to have laid it was still looking much distended near the vent.

27-6-30.—Five more eggs observed and a sixth later in the morning. This last was small with pointed ends. The contents of all appeared dark. On opening one the dark colouring was seen to be due to greyish streaks in the albumen. A little blood was present in the germinal disc.

28-6-30.—Two more rather small eggs.

30-6-30.—One small, malformed egg.

1-7-30.— do.

Unfortunately the snakes, although apparently in good health, refused to feed. On 16th July a female died and was found to contain six eggs. The largest individual was killed and preserved and the remainder released.

It was impossible to be certain which were the parents of the eggs laid in the tank, but two of the snakes were apparently males, and the eggs may probably be attributed to the females as follows:—

5-6-30.—6 eggs laid by Specimen A.
16-6-30.—1 egg ,, ,, B.
27-6-30.—6 eggs ,, ,, C.
28-6-30.—2 ,, ,, ,, B.
30-6-30.—1 egg ,, ,, B.
1-7-30.—1 ,, ,, ,, B.
16-7-30.—6 eggs (in oviduct) Specimen D.

This would give the average batch as 6, which agrees well with related Elapine land-snakes, with sea-snakes of known viviparous habit, and with Wall's discovery (3) of seven eggs in a female of *Laticauda laticaudata* (Linn.) in the Indian Museum. As Wall omitted to note whether these eggs contained embryos or not it is impossible to say whether this species is viviparous, but it probably resembles *L. colubrina* in its method of reproduction.

Two alternative explanations of the deposition of eggs by these snakes presented themselves. Either the snakes were truly oviparous, or the eggs were prematurely deposited. In order to determine the correct interpretation the eggs were examined for signs of development, and observations made on the snakes themselves both in capitivity and in their natural habitat.

No eggs were found showing any sign of a developing embryo such as would be found in eggs taken from an ovo-viviparous snake. Efforts to hatch the eggs under varying conditions were unsuccessful.

Several of the snakes cast their skins whilst in captivity. This was effected by shedding the skin in one piece after the manner of land-snakes, and not in small shreds, lizard-like, as do those Hydrophine snakes which have been observed.

Mr. P. M. de Fontaine of the Raffles Museum was of great assistance to me in making enquiries of the light-keepers on the islands where these snakes are commonly found, and was able to put me in touch with Mr. Adolf Monteiro, who not only secured the specimens, but obtained much valuable information. He has observed the eggs laid in crevices in the rocks on the island on which the Raffles Light-house stands. The female remains coiled round the eggs until long after hatching, gradually taking on the dull coloration and opacity of eye which heralds the approach of the moult. According to another keeper, Mr. Haffenden, the female guards her eggs jealously, refusing to be driven away, and snapping at intruders, an attitude rare in these snakes at normal times. He has seen the moult take place just previous to the hatching of the eggs.

I visited the island on 16th—17th July, 1930. Like the neighbouring islands, Pulau Biola and P. Senang (Barn Id.), on which the snakes do not appear to live, it is a granite mass, but in order to build the light-house the surface has been levelled with blocks of coral. It is in the crevices of this loose material that the snakes live and apparently breed. A snake was seen in a crevice in an old fig-tree, and one taken from a drain in a concrete wall. Cast skins were found near some of the holes, but further exploration would have necessitated an unwarranted amount of damage as the passages were long and winding. No eggs were obtained, but the keeper then in charge said that he had kept the snakes in captivity out of water, and one had laid eggs. Further reports seem to confirm the statement of Mr. Galistan, who has spent the greater part of his life at the various light-houses, that the snakes only appear in numbers from June to August. It seems to be established that they come to land, or at all events to these selected sites, for breeding purposes, June being the month of greatest activity. They may be seen in large numbers going down to the sea in the evening and returning in the early hours of the morning, though the female, after laying, probably fasts and does not leave her eggs.

Semper (4) found a female amongst the rocks of an island, coiled round about twenty young. He appears to have regarded the snake as viviparous but he says that the female comes ashore for breeding, and his estimate, as he apparently did not count the offspring, is probably quite erroneous. Half-a-dozen writhing snakes can easily give the impression of a score.

The facts adduced above appear to me conclusive, and afford additional evidence that the *Laticaudinae* are the most primitive of the Sea-Snakes, and the fore-runners of the *Hydrophiinae*. The form of the skull, which has been discussed in detail by Smith (2), the imbricate costals and broad, keeled ventrals, the form of the oral margin of the rostral shield, mode of casting the skin, and oviparity, all point to a close relationship with a terrestrial ancestor, probably of Elapine origin. The flat tail, whilst enabling these snakes to include the water within the range of their habitat, is not a draw-back on land and only postulates a marine ancestor if we accept the theory of adaptation to environment. On the other hand, the *Hydrophiinae* do not lack evidence of derivation from a land form. They are ovo-viviparous, and the eggs they form are clearly derived from those of a terrestrial ancestor. To regard them as primitive would require an egg-laying marine ancestor.

I cannot agree with Smith that there is any evidence to support his statement (2, p. vi) that the *Laticaudinae* were of Australian origin and the *Hydrophiinae*, Indo-Malayan. The division, whether early or late, took place in the original home of the ancestral form; there is no evidence to show where this was, but Indo-Malayan waters are undoubtedly very suitable for the launching of new forms. However, the fact that they are in some measure seasonal in their breeding may point to an origin outside these waters, for the most characteristic effect of the local climate is the complete lack of periodicity in growth and reproduction of both fauna and flora. From their place of origin the two sub-families spread side by side; the fact that the *Laticaudinae* have flourished in Australian waters means no more than that they have found a suitable habitat, as did the rabbit.

The following points observed during the preparation of these notes may be mentioned here. In a previous paper (5) it was shown that specimens of *L. colubrina* lacking the azygous prefrontal, (one of the characters on which it is divided from *L. laticaudata*) are by no means rare. Three of the six specimens referred to above showed this condition, which is probably as common as the other.

Several ticks were found on one of the snakes. The females were of the same grey as the body-colour of the snake, the males brown, and the ticks were shed with the cast skin. They have been sent to a specialist for identification.

[Since I wrote the above Dr. Malcolm Smith has expressed his opinion, in a letter published in Nature, 11th Oct., 1930, that the eggs laid by the snake mentioned in my preliminary note (1) were prematurely produced in consequence of captivity. He cites a specimen of this species, examined by himself, and containing embryos enclosed in a thin semi-transparent covering; he has also seen a specimen of another snake of the sub-family *Laticaudinae*, *Aipysurus eydouxi*, in which the embryos were present but enclosed in a thicker covering. In my reply (Nature, 3rd Jan., 1931, p. 13) I have pointed out the incontrovertible nature of the evidence cited above, and drawn the conclusion that Dr. Smith's specimen points to the fact that both oviparity and ovo-viviparity may exist within the bounds of a single species. Either the individual must be capable of either mode of reproduction, according to the relative accessibility of land, or a local race exists in the islands near Singapore in which oviparity is the rule. Semper's discovery of a female guarding her young on shore must surely be regarded as further evidence of oviparity; it is extremely improbable that a snake which has developed such a definite adaptation to a truly aquatic existence as ovo-viviparity should sacrifice the advantage thus gained by coming ashore to deposit the living young!

The co-existence within a genus of these two methods is by no means a rarity, and a species of lizard, *Lacerta vivipara*, is known in which the embryo may break its way out of the egg either before or after oviposition. Ovo-viviparity, far removed from viviparity with its placental connection between parent and young, is really a phase of oviparity; it is merely a question of the point in development at which the egg, already a separate entity, is deposited.]

REFERENCES

1. Smedley, Nature, Aug. 30th, 1930, p. 312.
2. Smith, Monograph of the Sea-Snakes, 1926, p. xiv.
3. Wall, Snakes of Ceylon, 1921, p. 428.
4. Semper, (quoted by Gadow. Camb. Nat. Hist., Reptiles, p. 637).
5. Smedley and Kloss, Journ. Malayan Br. Roy. Asiat. Soc., IV, 1926, p. 163.